

# Risk Factors of Stunting Among Children Under Five Years in Jombang, East Java

Amirah Muhammad Abdullah<sup>1</sup> & Abdul Haris Khoironi<sup>2</sup>

<sup>1</sup>Emergency Department, PKU Muhammadiyah Mojoagung Public Hospital, Jombang, Indonesia

<sup>2</sup>Pediatric Department, PKU Muhammadiyah Mojoagung Public Hospital, Jombang, Indonesia Surabaya, East Java, Indonesia

\*Corresponding author details: Amirah Muhammad Abdullah;  
[amirahmuhammadabdullah@gmail.com](mailto:amirahmuhammadabdullah@gmail.com)

## ABSTRACT

**Background:** Linear growth failure, or stunting, is the most prevalent form of undernutrition worldwide. Indonesia became country with the fifth largest prevalence of stunting. In 2021 around 23.5% of toddlers who are stunted in east java province The incidence of stunting can be influenced by several risk factors. **Objective:** To decide risk factor of stunting in children aged under 5 years old. **Methods:** This study observational analytic with case-control study design, data from the scope of the mayangan health center over 1 year, January until desember 2022. Subjects comprised 122 cases and 122 controls, totaling 244 subject were children aged under 5 years old selected by consecutive sampling. **Results:** The results showed that short birth length, total daily calory intake, history of ARI, and mother education has a significant association for stunting prevalence. Short birth length have 0.2 times higher risk of experiencing stunting, inadequate daily calory intake have 0.3 times higher than adequate group, history of ARI have 0.3 times higher of experiencing stunting, low mother education has 0.5 times higher that high mother education. **Conclusion:** The most influential variable in this study is short birth length, total daily calory intake, chronic diarrhea, history of ARI, and mother education, to be childhood stunting prevalence.

**Keywords:** stunting; risk factors; logistic analysis

## INTRODUCTION

Stunting is children who is too short for his or her age. The condition by a length or height of more than minus two standard deviations of WHO's median child growth standard (Laksono A et al, 2022). These children can suffer severe irreversible physical and cognitive damage that accompanies stunted growth. The devastating effects of stunting can last a lifetime and even affect the next generation (Leroy J et al, 2019).

Linear growth failure, or stunting, is the most prevalent form of undernutrition worldwide. An estimated 155 million, or 23% of children aged < 5 years worldwide are stunted defined by the World Health Organization (WHO) as a height-for-age (HAZ) score < -2 SD. In Indonesia, around 37% (almost 9 million) of children are stunted. Indonesia became country with the fifth largest prevalence of stunting. According to the results of the Indonesian Nutrition Status Study (SSGI), in 2021 around 23.5% of toddlers who are stunted in east java province (Riskesdas 2019). There are many factors that associated with stunted, socio-demographic factors, maternal factor, obstetric factor, and neonatal factor.

Undernutrition in childhood correlated with lower school achievement during adolescence, even after controlling for age and socioeconomic status. Undernutrition has a negative influence on school grade attainment, cognitive development and social status in general. The long term effects of stunting and lower education levels can lead to a lower economy productivity, perpetuating the vicious cycle of missions and malnutrition (Asiki G et al, 2019).

The incidence of stunting can be influenced by several risk factors, were as follows community and societal factors, household and family factors, inadequate complementary feeding, breastfeeding, and infection (WHO). If these risk factors are identified in detail, then the incidence of stunting is expected to decrease. Therefore, we aimed to identify risk factors that affecting stunting prevalence.

## METHODS

This study used observational analytic with case-control study design, collect data from secondary data from the scope of the mayangan health center, jombang, east java. Data over 1 year, January until desember 2022. This subjects comprised 122 cases and 122 controls, totaling 244 subject were children under 5 years old selected by consecutive sampling.

Subject data were collected from anthropometric measurements and interviews using a questionnaire. The following variables, grouped by factor, community and societal factors, household and family factors, inadequate complementary feeding, breastfeeding, and infection. Community and societal factors: parental income, parental education, and sanitation. Household and family factors: maternal stature. Inadequate complementary feeding based on recommended dietary allowance (RDA) in previous 24 hours, inadequate dietary if the total calory not achieve the RDA. Breastfeeding: exclusive breastfeeding (subjects were given only breast milk in the first 6th months of life except for medicine) and initiation breastfeeding. Infection: diarrhea in previous 24 hours and Acute respiratory infection in previous (ARI) 2 weeks.

Parental income was classified based on monthly minimum wage in Jombang, which was Indonesia Rupiah (IDR) 2,264,135 in 2018. Improved sanitation if subject has private toilets and septic tank.

The dependent variable was the prevalence of stunting. Data analyzed using SPSS. We first conducted a bivariate analysis between risk factors variable and prevalence of stunting with Chi-square test method and logistic regression where  $p < 0.05$  showed a significant difference.

## RESULT

A total of 244 subjects were included ( $n=122$  stunted,  $n=122$  non-stunted). Characteristics of that samples are shown in Table 1. This study methods using chi-square bivariate analysis and logistic regression. Eight of nine variables have a significant association with stunting. The incidence of stunting in short birth length is 13%, in children with no breastfeeding is 20.5%, 28.7% in children with inadequate daily calory intake, 18.7% in children with chronic diare, 20.9% in children with history of ARI, in children with low mother education is 21.7%, 16% in family with low parental income, and 11.5% in house with unimproved sanitation.

**TABLE 1:** Characteristic of samples.

Characteristics	(n-244)
Mean Age, months	32 (6-58)
Sex	
Male	127 (52%)
Female	117 (48%)
Median weight (range), grams	12 ( 5-18)
Median length (range), cm	88.30 (61-107)
Median birth weight (range), grams	2900 (2300-3500)
Median birth length (range), cm	50 (46-52)

**TABLE 2:** Analysis of association risk factors with stunting.

Characteristic	Stunted (n=122)	Non-Stunted (n=122)	p
Short Birth lenght			0.000
Yes	32 (13,1%)	8 (3,3%)	
No	90 (36,9%)	114 (46,7%)	
Exclusive Breastfeeding			0.010
No	50 (20,5%)	32 (13,1%)	
Yes	72 (29,5%)	90 (36,9%)	
Total Daily Calory Intake			0.000
Inadequate	70 (28,7%)	35 (14,3%)	
Adequate	52 (21,3%)	87 (35,7%)	
Chronic diarrrhea			0.000
Yes	45 (18,4%)	21 (8,6%)	
No	77 (31,6%)	101 (41,4%)	
History of ARI			0.000
Yes	51 (20,9%)	26 (10,7%)	
No	71 (29,1%)	96 (39,3%)	
Mother Education			0.002
Low	53 (21,7%)	31 (12,7%)	
High	69 (28,3%)	91 (37,3%)	
Father Education			0.060
Low	41 (16,8%)	29 (11,8%)	
High	81 (33,2%)	93 (38,2%)	
Total Parental Income			0.021
Low	39 (16%)	25 (10,2%)	
High	83 (34%)	97 (39,8%)	
Sanitation			0.000
Unimproved	28 (11,5%)	15 (6,1%)	
Improved	94 (38,5%)	107 (43,9%)	

Note. ARI: acute respiratory infection.

**TABLE 3:** Logistic regression analysis of risk factor for stunting.

Risk Factor	p-value	OR	CI 95%
Short Birth length			
Yes	0.004	0.269	0.11-0.661
No		Ref	
Exclusive Breastfeeding			
No	0.052	0.538	0.288-1.006
Yes		Ref	
Total Daily Calory Intake			
Inadequate	0.002	0.383	0.212-0.694
Adequate		Ref	
Chronic diarrhea			
Yes	0.014	0.427	0.217-0.843
No		Ref	
History of ARI			
Yes	0.002	0.367	0.194-0.697
No		Ref	
Mother Education			
Low	0.037	0.512	0.272-0.962
High		Ref	
Father Education			
Low	0.545	0.814	0.419-1.584
High		Ref	
Total Parental Income			
Low	0.297	0.698	0.355-1.372
High		Ref	
Sanitation			
Unimproved	0.087	0.505	0.231-1.103
Improved		Ref	

\*Variables with  $P < 0.25$  in the bivariate analysis that entered multivariate analysis.

\*\* OR: odds ratio, CI: confidence interval.

From bivariate analysis result, where the p-value  $< 0.25$ , will be continued to the logistic regression analysis method. The significant variable from logistic analysis, were as follows: short birth length (OR 0.269; 95%CI 0.110-0.661), total daily calory intake (OR 0.383; 95% CI 0.212-0.694), history of ARI (OR 0.367; 95% CI 0.194-0.697), and mother education (OR 0.512, 95% CI 0.272-0.962).

## DISCUSSION

Stunting is associated with unwanted outcomes in short, medium, and long period, were as follows: delays in child development that have an impact on school achievement, decreased physical strength and ability to work, risk of developing non-communicable diseases as adults and increased mortality (Leroy J, et al 2019). In the first 1000 days of life, it is very likely that children will become stunted if they don't get optimal support from their parents or diet pattern (Lukman T, et al 2021).

Stunting is causally related to poor birth outcomes (Leroy J, et al 2019). Children with a birth length of below 48 cm (short) have a 15.0 times higher risk of experiencing stunting ( $p < 0.05$ ; 95% CI: 2.58– 87.9) compared to children born with a body length  $\geq 48$  cm (Lukman T, et al 2021). Similar to our result, that short birth length have a significant association with stunting, where 26.2% of stunted subjects with short birth length (p-value 0.004, OR 0.269, 95%CI 0.11-0.661).

Stunting is associated with insufficient quality and quantity of food consumed, and less than optimal absorption of nutrients in the intestine, which trigger growth failure (Perumal N, et al 2018, Leroy J, et al 2019).

Breastfeeding has many advantages for infant, that is increase memory retention, language skills, and intelligence (Krol, K et al 2018). Suboptimal breastfeeding and recurrent infections can lead to growth faltering in weight and length in the first 6 months of life (Albelbeisi et al, 2018; Tello B et al, 2022). Children who have never breastfed have a greater risk of experiencing stunting (Marume A, et al 2023; Tello B et al, 2022). This finding was in agreement with ours: 40.98% (p-value 0.052, OR 0.538, 95% CI 0.288-1.006) of stunted subject were not exclusive breastfeeding. One of the contents of breast milk is immunoglobulin which functions to boost the immune system. Non breastfeeding is associated with recurrent infections. In this study there are two kinds of infection, chronic diarrhea and acute respiratory infection (Marume A, et al 2023).

Previous study found the significant association between diarrhea and childhood stunting (Mulyaningsih T, et al 2021). Diarrhea has an effect on growth by reducing food intake because it reduces appetite, increases metabolic needs, and decreases absorption of nutrients in the intestine. (Perumal N, et al 2018).

In agreement with our study, that chronic diarrhea have a 0.4 times higher risk to stunting prevalence ( p-value 0.014, OR 0.427, 95%CI 0.217-0.843). Children under 5 years of age tend to have more frequent acute respiratory infections (Imran M, et al 2019). In our study, there is a significant correlation between ARI and stunting (p-value 0.002, OR 0.367, 95%CI 0.194-0.697).

Children with stunting will be at risk of experiencing ARI more often. ARI is associated with the economic status of a family, where families with low income tend to experience ARI more often due to limitations in buying healthy cooking systems, hygienic toilets, and clean water source (Imran M, et al 2019; El-Koofy et al, 2022). Acute respiratory infections has adversely affect growth, same with other infection, whereas can reduce food intake because of decrease appetite. Reduced nutrition intake will have an impact on the child's weight and height, long-term effects can cause stunting (Mulyaningsih T, et al 2021). Infection and stunting are like a vicious circle, where children with recurrent infections will affect the immune system which will increase the risk of stunting, and children with stunting have a low immune system which makes them at risk of experiencing infection (Arini D, et al 2020).

The relationship between maternal education and stunting is widely supported by previous research (Noor M, et al 2022). These findings are well supported by our study, 63.1% of stunted subjects had a low mother education (p-value 0.037, OR 0.512, 95%CI 0.272-0.962). Most of the children were under the care of their mothers, and most of the time filmed with their mothers. Educated caregivers will have better nutrition knowledge, and tend to be more protective in parenting (Mulyaningsih T, et al 2021). Mother's education influences mother's awareness of the importance of a variety of foods and feeding practice, as well as the for decision-making and ability to have paid emoloyment, which is a condescendent factor for good nutrition (Budhathoki S, et al 2020). From our result, parental total income showed relationship with stunting prevalence (p-value 0.297, OR 0.698, 95%CI 0.355-1.372). Family with low education and low income, often found inadequate quality of food which results in decreased immunity which makes them susceptible to various kinds of infections, especially for diarrhea and acute respiratory infection (Soekatri, M et al 2020; El-Koofy et al, 2022).

Sanitation plays an important role in reducing the risk of stunting. Vilcin D et al, 2018 find that unimproved sanitation have sufficient evidence to support childhood stunting. Poor environmental quality, commonly found in low education and low income families, lack of knowledge and concern for food hygiene associated with exposure to pathogens via the faecal-oral transmission route (Soekatri, M et al 2020; Marume, A, et al 2023). These findings contradict with our result, that showed no significant association between sanitation and stunting prevalence (p-value 0.087).

The limitations of this study are the relatively small scope and limited variable examination. We suggest other researchers to conduct research with a larger scope and more diverse variables. In conclusion, the most influential variable in this study is short birth length, total daily calory intake, chronic diarrhea, history of ARI, and mother education.

#### CONFLICT OF INTEREST

There is no conflict of interests

#### FUNDING

There is no funding

#### ETHICAL APPROVAL

This research has been approved by the Medical Faculty University of Muhammadiyah Malang Ethics Research Committee (No. E.5.a/063/KEPK-UMM/III/2023). Informed consent was waived because of the retrospective nature of this study, which was approved by the Medical Faculty University of Muhammadiyah Malang Ethics Research Committee.

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